escapes out into the gravitational spaces by diffusion.

When the rain ceases the gravitational spaces drain of water, carrying off relatively a small part of the soluble matter, and the evaporation from the surface causes the upward movement to commence, but this movement is entirely capillary and the whole film around the soil grains moves, and as it moves so does all of the salt except possibly that portion absorbed, and there is evidence which leads one to believe that the absorbed salt moves also, but rather more slowly than the film; that is, the absorbed salt shows a tendency to lag behind.

Therefore, it will be seen that the rains do not move the salt as far down as they penetrate but leave the most of it near the surface of the soil or at least so close to the surface that capillary movements will again accumulate at the surface as soon as the dry season occurs.

This explanation of the movement of soluble salts within a soil finds application in a number of ways. In the arid regions, where the soluble salts are more abundant than in the humid climate, and where the movements of these salts, if not understood and controlled, ofttimes result in the accumulation of soluble matter this explanation of the difference in the rate of downward movement, compared with the upward movement, goes far to explain some points which were heretofore but imperfectly understood. For example, it has always been difficult for the writer to understand why alkali salts should continue to accumulate at the surface of the ground in spite of the repeated irrigations, and the maxim laid down by agriculturists in that region that 'alkali goes with the water.' In one district of especial notoriety in California the water table was thirty years ago about sixty feet below the surface of the ground and there were no indications of alkali. Irrigation was commenced and continued large and excessive quantities were used. All of the time the water table was steadily rising, showing unquestionably that more water went downward through the soil than came up for evaporation, and yet in spite of this accumulative downward movement of the water the alkali salts, which, so far as can be gathered from adjacent unirrigated areas, was within the surface twenty feet of the soil, have been steadily creeping upward and at the present time fully ten per cent. of the area is suffering from an excess of alkali salts.

It is plain that if we desire to send the salts downward the easiest way to do it is to make the downward movement, as far as possible, capillary instead of gravitational. One way of doing this is to break up the soil gravitational spaces by deep cultivation and subsequent firming by flooding. Such has been found very effective in certain areas of Arizona. Another way is to flood the soil with frequent shallow irrigations. In this way a slow downward capillary current is kept up. Half a dozen floodings with one inch of water each will be found to carry downward much more salt than one flooding of six inches.

Another lesson taught, one well known for many years, is that if the subsurface water is alkaline it must not be allowed to rise so close to the surface that continuous upward capillary movement is possible; else the alkali will accumulate in the soil, to its detriment.

THOS. H. MEANS.

BUREAU OF SOILS,
WASHINGTON, D. C.

CHEMISTRY IN THE CALIFORNIA SCHOOLS.

THE chemistry teachers of the Pacific coast have organized an association to encourage the teaching of chemistry, to harmonize methods, to become acquainted with each other and with the needs of the country and the conditions affecting their profession; and, generally, for all those purposes for which association is good. The organization was effected last August, during the Summer School session of the University of California, at which many teachers from California and from the neighboring States were present. The headquarters of the organization are at Berkeley, which, as it is the educational center of the western part of the country, is the natural location for such a purpose. Two members of the faculty of the University of California, one in the department of chemistry and one in the department of physics, were among the organizers.

The need for such an organization is shown

by the number of schools in which chemistry is taught. A recently published list shows that there are 116 schools in California whose graduates are admitted by the University of California without entrance examination. Twenty-five of these are not accredited in chemistry, but the remaining ninety-one have chemistry courses sufficiently thorough to satisfy all University requirements. And in the twenty-five not accredited in chemistry the subject is taught in most cases, though not with the necessary thoroughness. Moreover, there are many other schools in the State whose graduates are not accorded free entrance to the University, and the names of which do not, in consequence, appear on the published list, in which chemistry is one of the subjects taught. It is probable that in the State of California alone there are at least one hundred and fifty chemistry teachers; and it would be making a very modest estimate and one undoubtedly far below the true numbers to estimate at two hundred the chemistry teachers who look toward Berkeley for their inspiration.

As yet the new organization is in a formative condition. It has been getting itself together, rather than attempting to accomplish anything. Its first circular of information, just published, contains, however, a number of interesting facts. On data, not as complete as desirable, it was shown that the high-schools of California give their students a year of chemistry, recitations being supplemented with laboratory practice. The majority of the schools report fairly good laboratory facilities, one small school in the southern part of the State claiming to have a better equipment for elementary work than does the University itself. Of books of reference there is an almost total lack. In many cases there are no reference-books whatever.

One of the interesting features of the first circular is a letter from President Ira Remsen of Johns Hopkins on the proper methods of chemistry-teaching. He writes:

I thank you for the opportunity you have given me to say a few words to the members of your association. The formation of such societies as yours will, I am sure, do much to further the study of chemistry and raise the standard of teaching. As I have watched the work of teachers of our science in schools, in colleges and in universities, it has seemed to me that the chief defect is what in plain English may be called slovenliness. The students get into bad habits of work and have no clear idea in regard to what they are doing. They are often left to themselves too much and work as they ought not to, without knowing that anything is wrong. Then, too, when the students attempt to give an account of what they have done, they use language that would hardly be permitted in a recitation room or in writing about a literary or historical subject. The language and the notebooks are apt to be slovenly, especially if the work has been slovenly. Now, we shall never get what we ought to get from laboratory courses in chemistry or any other subject until this slovenliness is eliminated. The ability to state the source of an element, its properties or the law of definite proportions or any other law —this ability is of little value. This kind of knowledge is meaningless unless based upon some actual experience in the laboratory.

Courses in scientific subjects are still on trial, and we teachers of chemistry are to determine by the way we do our work whether these courses are to be recognized as valuable from a purely educational point of view. Too much of the instruction now given seems to be shaped with the idea that the pupils are all to become chemists. As a matter of fact, this is true of very few of them. But I may as well stop here. I have opened up too broad a subject to be dealt with satisfactorily at this sitting.

Edward Booth,
Secretary.

SCIENTIFIC NOTES AND NEWS.

Professor Yves Delage has been elected a member of the Paris Academy of Sciences in the section of zoology, in the place of the late Lacaze-Duthiers.

Mr. Philip Watts, F.R.S., has been appointed director of naval construction by the British Board of Admiralty, succeeding Sir William H. White, F.R.S., who has resigned in consequence of ill health.

Dr. Charles Porter, M.D., of Shrewsbury, has been selected for the appointment of medical officer of health to the municipality of Johannesburg. The salary is £2,000 per annum.